CLAIMS:

1. A method of manufacturing a micro-optics structure having at least one lenslet array, the method comprising:

(A) providing a writing mask configured in accordance with an arrangement of the lenslet array to be manufactured; and

(B) applying said writing mask to a structure formed by a photosensitive layer of a predetermined thickness carried by a substrate, and exposing the photosensitive layer through said writing mask using a predetermined spectral range of the exposure and a predetermined distance between the mask and said photosensitive layer, thereby patterning the photosensitive layer through a diffractive optical element of said mask, said pattern being in the form of optical nonhomogeneities in the photosensitive layer material, thereby producing said at least one lenslet array within said photosensitive layer.

2. The method of Claim 1, wherein said substrate is a glass layer.

3. The method of Claim 1, wherein said substrate is a semiconductor structure.

4. The method of Claim 1, wherein said substrate is a layer structure of a pixel arrangement of a spatial light modulator (SLM).

5. The method of Claim 3, wherein said substrate is a layer structure configured as a matrix drive system of a pixel arrangement of a spatial light modulator (SLM).

6. The method according to any one of preceding Claims, wherein said photosensitive material is photoresist.

7. The method of Claim 1, wherein said writing mask is configured as an incoherent light writing mask.

8. The method of Claim 7, comprising fabricating said incoherent light writing mask, the fabrication including:

(i) creating a computerized file related to a pattern forming said incoherent light writing mask, the pattern being indicative of morphology of said micro-optics structure defining said at least one lenslet array;

(ii) plotting the file on a photo film, thereby creating an image related to the pattern;

(iii) developing and fixing the photo-film;

(iv) minifying the image by imaging it on a milimask;

(v) copying the image from the milimask on a glass plate,

whereby said glass plate is used as said writing mask.

9. The method of Claim 8, wherein said file is a postscript file.

10. The method of Claim 8, wherein said milimask is made of glass material.

11. The method of Claim 8, wherein said minifying of the image includes:

providing an undeveloped milimask coated with a light sensitive emulsion;

exposing the coated milimask to light radiation indicative of said image;

developing and fixing the milimask.

12. The method of Claim 8, wherein said copying of the image on the glass plate includes:

providing an undeveloped glass plate coated with a chrome and a positive photo-resist;

exposing said glass plate to UV light passing through said milimask;

developing said glass plate;

placing the glass plate into chrome etcher; and

removing the photo-resist from the glass plate.

13. The method of Claim 12, wherein said exposing of said glass plate to UV light includes positioning said glass plate on a predetermined distance from the milimask by using a mask aligner.

14. The method of Claim 7, comprising fabricating said incoherent light writing mask, the fabrication including :

(i) creating a computerized file related to a pattern forming said incoherent light writing mask, the pattern being indicative of morphology of said micro-optics structure defining said at least one lenslet array;

(ii) providing an undeveloped glass plate coated with a chrome and a photo-resist sensitive to e-beam radiation;

(iii) drawing said pattern on the undeveloped glass plate by using e-beam technique;

(iv) developing said glass plate;

(v) placing the glass plate into chrome etcher; and

(vi) removing said photo-resist from the glass plate.

15. The method of Claim 1, wherein said writing mask is a coherent light writing mask.

16. The method of Claim 15, wherein said writing mask is in the form of surface relief defining an array of protrusions spaced-apart by cavities.

17. The method of Claim 16, comprising fabricating said coherent light writing mask, the fabrication including:

(i) creating a computerized file related to a pattern forming said coherent light writing mask, the pattern being indicative of morphology of said micro-optics structure defining said at least one lenslet array;

(ii) applying at least one technique selected from diamond milling, soft lithography and direct writing to a glass plate, thereby forming said pattern having protrusions and cavities on a surface of the glass plate.

18. The method of Claim 17, wherein for a distance a between a top of the protrusions and a bottom of the cavities the following condition is fulfilled:

$$a \leq \frac{\lambda}{2(n_1 - n_2)},$$

where λ is the wavelength of the light; n_1 and n_2 are the refractive index of the material of the glass plate and the surrounding media, respectively.

19. The method of Claim 1, comprising:

(a) providing the substantially uniform layer of a predetermined thickness of the photosensitive material on the substrate;

(b) applying a Soft-Baking to said substrate covered with the photosensitive material at a predetermined temperature over predetermined time period;

(c) applying the exposure to at least a portion of the substrate covered with the photosensitive material to light passing through the writing mask over a predetermined exposure time period;

(d) applying a Post-Exposure-Baking to the substrate covered with the photosensitive material at a predetermined temperature over a predetermined time period; and

(e) gradually cooling the covered substrate after said Post-Exposure-Baking to a predetermined temperature.

20. The method of Claim 19, wherein said substrate is a plate made of large area glass.

21. The method of Claim 20, further comprising:

(g) developing the covered substrate after the gradual cooling;

(h) rinsing the covered substrate after the developing; and

(i) drying the covered substrate after the rinsing.

22. The method of Claim 1, wherein the photosensitive material is located on top of a glue layer carried by said substrate.

23. The method of Claim 19, wherein the uniform thickness of the layer of the photosensitive material is produced utilizing a spin-coating technique.

24. The method of Claim 19, wherein said substrate is a semiconductor wafer.

25. The method of Claim 22, wherein said substrate is a semiconductor wafer.

26. The method of Claim 24, further comprising:

(g) developing the covered substrate after the gradual cooling;

(h) rinsing the covered substrate after the developing; and

(i) drying the covered substrate after the rinsing.

27. The method of Claim 19 and 25, further comprising:

(g) developing the covered substrate after the gradual cooling;

(h) rinsing the covered substrate after the developing; and

(i) drying the covered substrate after the rinsing.

28. The method of any one of preceding Claims, wherein the photosensitive material is photoresist.

29. The method of Claim 28, wherein said photo-resist material is SU-8.

30. The method of Claim 19, wherein said providing of the uniform layer includes spinning the substrate at a speed required for obtaining said uniform photosensitive layer.

31. The method of Claim 29, wherein said predetermined temperature of said Soft-Baking is in the range of 80^0C -100 ^{0}C.

32. The method of Claim 29, wherein said predetermined time period of said Soft-Baking is in the range of 1 minutes to 3 minutes.

33. The method of Claim 19, wherein said light is applied to the photosensitive material at a predetermined angle.

34. The method of Claim 19, wherein said light is spatially incoherent UV light.

35. The method of Claim 29, wherein said light is spatially incoherent UV light characterized by specific energy between 200mW/cm^2 and 300mW/cm^2.

36. The method of Claim 29, wherein said light is spatially incoherent UV light applied over 0.5-1 minutes.

37. The method of Claim 19, wherein said light is spatially coherent UV light.

38. The method of Claim 29, wherein said light is spatially coherent UV light characterized by specific energy between 200mW/cm^2 and 300mW/cm^2.

39. The method of Claim 29, wherein said light radiation is spatially coherent UV light applied over 0.5-1 minutes.

40. The method of Claim 19, wherein said Post-Exposure-Baking is carried out in more than one stage.

41. The method of Claim 40, wherein said Post-Exposure-Baking is carried out in two stages.

42. The method of Claim 41, wherein said predetermined temperature of said Post-Exposure-Baking at a fist stage is in the range of about 60^0C to 70 ^{0}C.

43. The method of Claim 40, wherein said predetermined time period of said Post-Exposure-Baking at a fist stage is in the range of about 0.5 minutes to 1.5 minutes.

44. The method of Claim 40, wherein said predetermined temperature of said Post-Exposure-Baking at a second stage is in the range of about 90^0C to 100 ^{0}C.

45. The method of Claim 40, wherein said predetermined time period of said Post-Exposure-Baking at a second stage is in the range of about 0.5 minutes to 1.5 minutes.

46. The method of Claim 19, wherein said predetermined temperature to which the substrate being gradually cooled after said Post-Exposure-Baking is a room temperature.

47. The method of Claim 19, wherein said developing of the covered substrate is carried out over the time range of about 2 minutes to 3 minutes.

48. The method of Claim 19, wherein said rinsing is carried out in an Isopropyl-Alcohol solution.

49. The method of Claim 19, wherein said drying is carried out in a stream of Nitrogen.

50. The method of Claim 22, wherein said glue layer is made of OP-4-20658.

51. The method of any one preceding claims comprising forming a flattening layer on top of the patterned layer of the photosensitive material.

52. The method of Claims 51, wherein the flattening layer is OP-44 material.

53. The method of Claims 22 to 52, comprising selecting thicknesses of the glue layer and the photosensitive layer so as to match a distance between the lenslet formed in the photosensitive material and a medium with witch the lenslet array is used to affect light propagation therethrough.

54. The method of Claim 53, wherein said medium is a liquid crystal medium of an SLM.

55. A Spatial Light Modulator (SLM) device manufactured by the method of any one of preceding Claims.